

## Editorials

### Life Cycle Assessment in the Mirror of Int J LCA

#### Past, Present, Future

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In the previous issue of this journal, David Hunkeler and Gerhard Rebitzer published an editorial about 'The Future of Life Cycle Assessment' [1]. In this issue, the last of the 10<sup>th</sup> volume, I would like to discuss the development of Life Cycle Assessment as it is reflected in the contributions to our journal, including some deliberations toward possible future developments.

In this context, it may be relevant to mention that not all LCA studies are published, and the results of the analysis are therefore limited to the 'public' part of our science. It was pointed out [1] that publication in itself is not the primary aim of LCA, but rather the improvement of the environmental performance of products. Although this is true, the authors and commissioners of excellent and influential LCA studies should surmount the obstacles of secretiveness and lack of time, and should submit short versions of their studies for peer review (see also [2]) and publication. Above all, LCA is a learning process which can be conducted either privately within companies (if the competitiveness is at stake), or publicly for the benefit of the whole LCA community and beyond.

#### Past and Present

An analysis of the papers published between 1996 (Vol. 1) and October 2005 (Vol. 10 (5) + online first [3]) reveals that approximately just as many papers (120–130) can be assigned to 'LCA Methodology' and to 'Case Studies'. This reflects our publishing policy which was first announced in the inaugural issue [4] and re-affirmed after intense discussions with the editorial board after five years of experience [5].

Whereas the methodological papers show no trend in time, the number of published case studies have been reduplicated from 1996–2000 (volumes 1 to 5) and to 2001–2005 (volumes 6 to 10). Other types of (non-peer-reviewed) contributions include 'Letters to the Editor' (24), 'Book reviews' (17), 'New LCA Theses' (26), 'Editorials' and other, more specific contributions, which may partly overlap with the categories mentioned. This data material provides a clear picture of the 'supply-side', i.e. our authors' publication needs.

The needs of the 'demand-side', i.e. the LCA community, can be gathered from the download statistics<sup>1</sup> (see the 'Hitlist'

on the website [3]). The 'Top 35 Downloads' [6] correspond with more than 100 downloads per publication. 20 of the 35 most frequently downloaded papers belong to 'LCA Methodology' (a total of 2,806 downloads), 9 to 'Case studies' (a total of 1,111 downloads), while 3 belong to 'Life Cycle Management' ('CML' studies) (a total of 420 downloads), two papers are 'working group reports', and one is a 'Commentary'. Altogether, the top 35 were downloaded 4,710 times.

The 'Top 3 Downloads' consist of Dreyer et al. 'Comparison of Three Different LCIA Methods: EDIP97, CML2001 and Eco-indicator 99 – Does it matter which one you choose?' [7] ('gold', 256 downloads), Jolliet et al. 'IMPACT 2002+: A New Life Cycle Impact Assessment Methodology' [8] ('silver', 201 downloads), and Schmidt et al. 'A Comparative Life cycle Assessment of Building Insulation Products made of Stone Wool and Flax. Part 1' [9] ('bronze', 191 downloads). This ranking shows that LCIA has a high priority in the interest of the readers. 'Uncertainty' and closely related topics such as reliability, variability and limitations of LCA, are represented by 5 papers (a total of 740 downloads). Submissions relating to this area have increased recently (at this time, i.e. in October, some of them are under review, and 5 papers are published in OnlineFirst. Sincere thanks to Andreas Ciroth for professionally managing these papers as section editor! Another methodological topic, 'Consequential LCI' [10], conquered place 6 (166 downloads), followed by the LCM topic 'Eco-efficiency' [11] (160 downloads).

Case study topics, of course, vary broadly. In the 'Top 35 Downloads', themes such as insulation (positions 3 and 16), agriculture and forestry, including biodiesel (4 papers), can be found. Case studies have been downloaded more frequently than expected from the top 35 statistics. All in all, 366 publications have been downloaded at least twice, yielding a total of 21,736 downloads since July 2001, and an average of 60 downloads per published paper. The recently published and thus not frequently downloaded OnlineFirst papers are included. Not included are abstracts, book reviews, editorials, letters to the editor, etc., which all can be downloaded free of charge.

All these figures constitute, of course, only a snapshot<sup>2</sup> in time, since new downloads occur daily.

<sup>1</sup> Downloads of PDF files by authorized persons (subscribers) – since July 2001; peer-reviewed papers published in print and online/online first; the download of full papers has been possible since Volume 3 (1998)

<sup>2</sup> The top 35 list was downloaded October 6, 2005, the total list on the next day (small deviations were observed)

## The Future

The most important future needs identified in [1] concern

- implementation of LCA in daily practice as well as in decision-finding in industry, and
- extension of LCA toward sustainability assessment by developing Life Cycle Costing (LCC) and Social Life Cycle Assessment (SLCA) as separate assessment tools closely related to LCA by equal system boundaries.

These goals are worth the effort and supported by a recently published strategic article by Udo de Haes et al. [12], in which three approaches are presented to overcome the well-known limitations of LCA:

- extension of LCA
- use of a 'toolbox'
- hybrid analysis

This lucid analysis takes into account that some of the intrinsic limitations of LCA are closely correlated with the strength of this unique assessment tool as '*a global tool, quantifying burdens to the environment over the whole life cycle of a product, material, service, or facility in relation to a functional unit*' [12]. Although most of the recent developments of LCA to improve the spatial and temporal aspects and other, evident short comings are presented and discussed, a warning not to put the advantages of traditional LCA at stake, cannot be overseen in this review. Rather, it is suggested that one combine and carefully use different tools, selected within a decision situation, if necessary. The combined use of LCA, LCC and SLCA fits well into this approach and it is suggested that it be developed further. Hybrid analysis is seen as a close association of LCA with Input-output analysis and is, as such, much more than an uncoordinated tool-box game. Actually, hybrid analysis is an enrichment of LCA for certain situations, in which the traditional LCA is not sufficient. This is the place to thank Sangwon Suh for having introduced I/O and hybrid LCA in our journal, and for acting as a successful section editor.

Finally, I would like to mention that LCA in its standardised ISO form obtains new duties in other fields which are also on the ISO 14000 agenda, especially in type III environmental declarations. The relevant standard ISO 14025 is now approved. This type of formalised product declaration goes far beyond eco-labelling<sup>3</sup> and relies on LCAs according to ISO 14040ff. The main part of the norm describes the procedure necessary for preparing the declarations [13]. This topic will not be neglected in Int J LCA, and first papers will soon appear in the LCM section. The criticism recently put forward by Hertwich [14], with regard to the use of LCA in sustainable consumption, is therefore not justified: LCA may be less suitable for the macro-economic scale, but is still the best (and the only standardised) assessment tool for the product level. Extensions from purely environmental assessment (LCA) toward sustainability assessment (of products) are under way, as indicated above.

ISO 14001 (and the European counterpart EMAS) does not strictly require LCAs, although 'Gate-to-gate LCAs' are an excellent starting point for improvements within single production facilities – the targets of these standards. Data obtained for such plants can be used as foreground data for the product LCAs to complement or expand the site-specific environmental assessment [15]. Only in that way, can a complete picture of the environmental performance of a company or single plant be gained.

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<sup>3</sup> It should be remembered that the EU-ecolabel in the early 1990s was the first to prescribe LCAs for the identification of criteria and priority setting.

<sup>4</sup> In order to see all downloads, replace '35' by '400'; in the same way, the top 10, top 25, etc. lists can be generated. In order to identify the authors of the individual articles or to download the abstracts, double-click on the corresponding entry in the list.